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The geographic range of *Uma scoparia* Cope, 1894 (Squamata: Phrynosomatidae) in Arizona

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Abstract: Surveys dedicated to better describing the distribution of *Uma scoparia* in Arizona are reported. These extend this species' distribution in La Paz County, Arizona, 20 km further to the south than previously described. Six records on the outside of a confused range are presented alongside data from 170 captures within this range. This species is well known from California but its Arizona distribution is little understood and less well studied than other members of its genus. Concern about the conservation status of the disjunct Arizona population makes this report valuable to resource managers. Lizards were observed with ease and in large numbers at nearly all sites surveyed.

Key words: fringe-toed lizards; distribution; sand dunes; new records

The fringe-toed lizards in the genus *Uma* (Baird 1858) occur in eolian habitats of North American deserts (Robinson & Barrows 2013). There are four known species of *Uma* in the United States of America (Crother et al. 2012), and of these, two are known to occur in Arizona (Brennan & Holycross 2006). Because these psammophilic lizards are threatened by habitat fragmentation and loss of eolian sand connectivity, they are species of greatest conservation need; however, they are locally data deficient and are high priority for land management agencies throughout their range in the USA and Mexico (Murphy et al. 2006). Of the species of *Uma* found in the USA, *U. scoparia* Cope, 1894 (Mohave Fringe-toed Lizard) is the northernmost member. The distribution of *U. scoparia* fits strictly within sandy soils in the USA and ranges from isolated dunes in the northern Mohave Desert in California to its southern boundary along the San Bernardino Mountains. To the west, the distribution is marked by two extirpated populations west of Barstow, California (Murphy et al. 2006) and to the east they are known near Parker, Arizona, not far from the Colorado River (Elvin 1960).

However, the extent of the distribution of *U. scoparia* within Arizona is not clear. For example, three resources used to define the range of the species show a smaller Arizona distribution chronologically. The first Arizona record was collected 15 miles southeast of Parker, Arizona (Elvin 1960). This location has remained the sole occurrence of *U. scoparia* in Arizona according to some published literature (Pough 1974; Stebbins 2003) until the release of Brennan & Holycross (2006) which accounted for the entire expanse of the Cactus Plains dunes and a disjunct population in the Weaver dunes. However, this distribution map was apparently overlooked in later versions of range maps published for this species (Jones & Lovich 2009; Gottscho et al. 2017). Here, we clarify the extent of the distribution for *U. scoparia* in Arizona and submit six photograph voucher specimens.

To visualize the available data, we digitized two existing range maps that provide the best available information for determining range or distribution extents for this species. These were Brennan & Holycross (2006) and Gottscho et al. (2017). High resolution digital images were imported into ArcGIS 10.3 (ESRI, Redwoods, California, USA.) and fitted to an Arizona counties shapefile using the georeferencing tool. Per map, 10 or more control points were utilized to ensure that the reference layer and the digitized layer were in the correct geographic space. Next we digitized the maps as shapefiles by tracing around the range maps. In addition to these maps we accessed the Heritage Data Management System (HDMS) records database at the Arizona Game and Fish Department (AGFD). These combined resources were utilized in the planning stage of this survey.

To conduct surveys, we focused our efforts on sandy soils in the Cactus Plain north of Bouse, Arizona, the La Posa Plains south of Bouse, and the Weaver dunes southeast of Ehrenburg, La Paz County, Arizona (Figure 1). Surveys were conducted in eolian sandy habitat due to *U. scoparia*'s

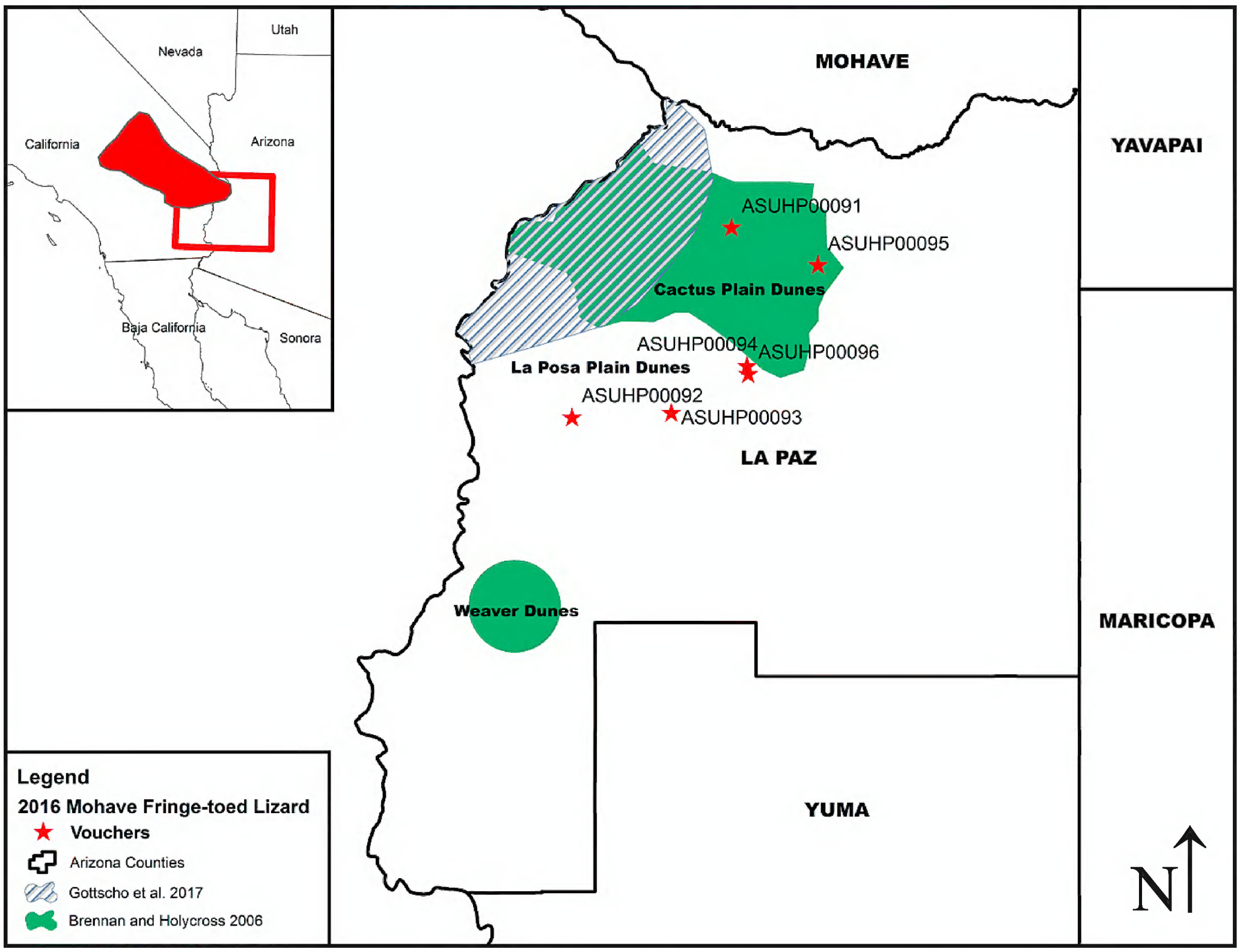

Figure 1. Two suggested Arizona distributions for *Uma scoparia* and the photo vouchers submitted in 2016, La Paz County, Arizona, USA.

preference for these soils (Pough 1970; Espinosa 2009). Surveys were conducted for 3 person-hours and survey sites were approximately 3 km apart, which is three times the known distance for movements of an individual *U. scoparia* (Kaufman 1982). In a few cases habitat was isolated by rocky or gravelly soils, causing some survey sites to be less than 3 km apart.

Surveys began by walking in sandy substrate and continued until a *U. scoparia* was detected or when surveyors reached the three survey-hour time limit. For each *U. scoparia* captured, we recorded capture time, location data (in UTMs; datum: NAD 1983), sex, temperature (air, lizard, substrate), took photographs, and took genetic samples. We determined sex by examining the presence or absence of enlarged post anal scales, enlarged gonads and more prominent femoral pores. Photographs captured the dorsum, venter, throat pattern, and the whole body. We collected tissue samples from one individual per survey location. Digital photograph vouchers were submitted to the Arizona State University Herpetology Collection (ASUHP) and held at the Arizona Game and Fish Department's HDMS.

Between 29 February 2016 and 27 April 2016 we conducted 96 surveys for *U. scoparia* and photo-vouchered 6 of the 170 individuals captured. On 29 February 2016 at 16:21 we hand-captured a buried adult male *U. scoparia* (ASUHP 00091) 1.75 km southeast of the junction between Swansea Mine Road and Central Arizona Project Canal, La Paz County, Arizona (Figure 1). On 2 March 2016 we hand-captured a juvenile *U. scoparia* (ASUHP 00093) at the southeastern edge of La Posa Plain dunes where they are blown into the Plomosa Mountains, 7 km east (by air: northeast) of Junction between Plomosa Drive and Sunkist Trail La Paz County, Arizona (Figure 1). On 16 March 2016 we captured a juvenile female *U. scoparia* (ASUHP 00092) on the southwestern edge of La Posa Plain dunes, 2km west of Kaiser Wash, 7.5 km northwest of Boyer Gap Road, La Paz County, Arizona. On 22 March 2016 we hand-captured a juvenile *U. scoparia* (ASUHP 00094) at an isolated dune 8 km southeast of Bouse, La Paz County, Arizona (Figure 1). On 24 March 2016 we hand captured a subadult *U. scoparia* (ASUHP 00095) at the northeastern edge of Cactus Plain dunes 7 km southeast of the junction of Swansea Road, Lincoln Ranch Road, and Powerline Roads, La Paz County, Arizona (Figure 1). On 25 March 2016 we captured an adult male *U. scoparia* (ASUHP 00096) in an isolated dune 10 km southeast of Bouse, La Paz County, Arizona (Figure 1).

Figure 2. Adult male, subadult female, and juvenile *Uma scoparia* (right to left) with distinctive throat crescents.

Among the key characteristics that separate *U. scoparia* from other species of *Uma* are the throat streaks that form crescents (Figure 2; Powell et al. 1998). All of the 170 individuals captured in this survey were photographed and documented to have this same pattern. Given that no other species of *Uma* has been noted to have this pattern and the recent molecular work of Gottscho et al. (2017) maintains *U. scoparia* as a single species, all individuals captured during our surveys represented *U. scoparia*.

In most cases, available maps for this species over-predict their distribution to the north and under-predict their distribution to the south in Arizona (Figure 1). The distribution of this species is important as land managers in the region are attempting to prioritize expected land development. Utility-scale solar facilities are planned throughout the desert southwest (Lovich & Ennen 2011) and state governments may have different goals, objectives, and intentions. Often during the construction of these utility-scale solar facilities, surface soils and vegetation are graded to make facilities maintenance easier (Hernandez et al. 2014). This practice is a known threat to sand dune lizard communities and often impacts specialists the hardest (Barrows et al. 2008; Leavitt & Fitzgerald 2013; Hibbitts et al. 2013).

Uma scoparia is a habitat specialist that occurs only in wind-blown sandy soils (Robinson & Barrows 2013) and is a "Species of Special Concern" in the state of California (Murphy et al. 2006). In Arizona, they are listed by AGFD as a "Species of Greatest Conservation Need" tier 1B because of concerns related to their disjunct distribution and fragmentation (AGFD 2012). Where we found *U. scoparia* in 2016 they were abundant and easily detected. Their distribution in Arizona is very isolated by natural barriers and existing roadways. Here we present data that would suggest an expansion from the Brennan & Holycross (2006) map of approximately 20 km and from the Gottscho et al. (2017) map of 26 km. Future planning by land managers in this region should be aware of the unique habitat occupied by this species. In particular, we observed extensive off-highway vehicle use of the far southeastern dunes at the edge of the La Posa Plains and the Plomosa Mountains (ASUHP 00093). We do not know what threat, if any, is posed by this activity, but it is a potential source of habitat degradation in an area previously unrecognized as habitat for *U. scoparia*.

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LITERATURE CITED

AGFD (Arizona Game and Fish Department). 2012. Arizona's state wildlife action plan: 2012–2022. Phoenix: Arizona Game and Fish Department. Accessed online at: https://www.azgfd.com/PortalImages/files/wildlife/2012-022_Arizona_State_Wildlife_Action_Plan.pdf on October 26, 2016

Baird, S.F. 1858. Description of new genera and species of North American lizards in the Museum of the Smithsonian Institution. Proceedings of the National Academy of Sciences 1858: 253–256. http://biodiversitylibrary.org/page/47535846

Barrows, C.W., K.L. Preston, J.T. Rotenberry & M.F. Allen. 2008. Using occurrence records to model historic distributions and estimate habitat losses for two psammophilic lizards. Biological Conservation 141: 1885–1893. doi: https://doi.org/10.1016/j.biocon.2008.05.006

Brennan, T.C. & A.T. Holycross. 2006. Field guide to amphibians and reptiles in Arizona. Phoenix: Arizona Game and Fish Department. 152 pp.

Crother, B.I., J. Boundy, F.T. Burbrink, J.A. Campbell, K. De Queiroz, D.R. Frost, D.M. Green, R. Highton, J.B. Iverson, F. Kraus, R.W. McDiarmid, J.R. Mendelson, P.A. Meylan, A. Pyron, T.W. Reeder, M.E. Seidel, S.G. Tilley, & D.B. Wake. 2012. Scientific and standard English names of amphibians and reptiles of North America, north of Mexico, with comments regarding confidence in our understanding. 7th edition. Shoreview, Minnesota: Society for the Study of Amphibians and Reptiles. 92 pp.

Elvin, D.W. 1960. Range Extension for *Uma scoparia* Cope. Herpetologica 16: 31–31.

Espinosa, R.E. 2009. *Uma scoparia* (Mohave Fringe-toed Lizard); pp. 278–281, in: L.L. Jones & R.E. Lovich. Lizards of the American Southwest: a photographic field guide. Tucson, Arizona: Rio Nuevo Publishers.

Gottscho, A.D., D.A. Wood, A.G. Vandergast, J. Lemos-Espinal, J. Gatesy & T.W. Reeder. 2017. Lineage diversification of fringe-toed lizards (Phrynosomatidae: *Uma notata* complex) in the Colorado Desert: delimiting species in the presence of gene flow. Molecular Phylogenetics and Evolution 106: 103–117. doi: https://doi.org/10.1016/j.ympev.2016.09.008

Hernandez, R.R., S.B. Easter, M.L. Murphy-Mariscal, F.T. Maestre, M. Tavassoli, E. B. Allen, C.W. Barrows, J. Belnap, R. Ochoa-Hueso, S. Ravi & M.F. Allen. 2014. Environmental impacts of utility-scale solar energy. Renewable and Sustainable Energy Reviews 29: 766–779. doi: https://doi.org/10.1016/j.rser.2013.08.041

Hibbitts, T.J., W.A. Ryberg, C.S. Adams, A.M. Fields, D. Lay & M.E. Young. 2013. Microhabitat selection by a habitat specialist and a generalist in both fragmented and unfragmented landscapes. Herpetological Conservation and Biology 8: 104–113. http://herpconbio.org/Volume_8/Issue_1/Hibbitts_etal_2013.pdf

Jones, L.L. & R.E. Lovich. 2009. Lizards of the American Southwest: a photographic field guide. Tucson, Arizona: Rio Nuevo Publishers. 567 pp.

Kauffman, J.S. 1982. Patterns of habitat resource utilization in a population of *Uma scoparia*, the Mojave Fringe-toed Lizard [Masters' thesis]. Chicago: University of Illinois. 78 pp.

Leavitt, D.J. & L.A. Fitzgerald. 2013. Disassembly of a dune-dwelling lizard community due to landscape fragmentation. Ecosphere 4: art97. doi: https://doi.org/10.1890/ES13-00032.1

Lovich, J.E. & J.R. Ennen. 2011. Wildlife conservation and solar energy development in the desert southwest, United States. Bioscience 61: 982–992. doi: https://doi.org/10.1525/bio.2011.61.12.8

Murphy, R.W., T.L. Trépanier & D.J. Morafka. 2006. Conservation genetics, evolution and distinct population segments of the Mojave fringe-toed lizard, *Uma scoparia*. Journal of Arid Environments 67: 226–247. doi: https://doi.org/10.1016/j.jaridenv.2006.09.023

Pough, F.H. 1974. *Uma scoparia*. Catalogue of American Amphibians and Reptiles. 155: 1–2.

Powell, R., J. T. Collins & E. D. Hooper Jr. 1998. A key to amphibians and reptiles of the continental United States and Canada. Lawrence: University Press of Kansas. 131 pp.

Robinson, M.D. & C.W. Barrows. 2013. Namibian and North American sand-diving lizards. Journal of Arid Environments 93: 116–125. doi: https://doi.org/10.1016/j.jaridenv.2012.08.003

Stebbins, R. C. 2003. Western reptiles and amphibians. 3rd edition. Boston: Houghton Mifflin Company. 552 pp.

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